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Agricultural Memorandum No. 1029

'The Practical Experience of Shelter for Sheep.'

by J. R. Starr

Summary

Pioneering shelter studies have been made in Britain by Cadman (1953), Hogg (1959), Caborn (1965) and Gloyne (1967).

Although there is a continuing awareness of the need for shelter even in moderate climates (WMO 1978, Starr 1981, Harrison 1982), a library survey reveals great deficiency in our knowledge of the rôle of shelter in livestock performance and pasture production (Sturrock 1984).

Comments are offered on the practical situation of shelter for sheep in Wales.

I SHELTER FOR LIVESTOCK

It seems self-evident and seemingly confirmed by observations of animal behaviour and judgements of shepherds and herdsmen that shelter from stormy winds can reduce the stress on an animal and hence lead to higher productivity (Gloyne 1976).

Such ideas have been reinforced by controlled chamber studies on shorn sheep in which the maintenance of body temperatures required consumption of more energy from additional food and/or body reserves (Webster 1974). However, field trials in Wales have not yielded such positive results, there being no evidence that outdoor exposure of pregnant Welsh Mountain Ewes significantly decreased reproductive performance, prepartum weights and productivity (Lucas and Alliston 1976).

Nevertheless, the important concept is that under wet and windy conditions most categories of stock (except perhaps adult cattle and fully fleeced sheep) are likely to encounter temperatures below their Lower Critical Temperature, Tc (Tc depends both on climate and 'animal' factors which influence the heat balance of the animal). Even small lambs should be able to maintain 'Summit Metabolism' for at least six hours. Theoretically, by lowering wind-speeds and offering a degree of protection from rainfall, shelter improves the local environmental conditions affecting heat balance, although Sykes, Griffiths and Slee (1976) showed breed differences and the length of the birthcoat to be important.

II THE PRACTICAL SITUATION

The microclimate which the lamb achieves for itself or has provided for it by the ewe will often contrast sharply with the climate conditions measured in the field; short period fluctuations, too, may be critical.

Australian work (Lynch, Mottershead and Alexander 1980) showed that Merino ewes sought isolation at lambing making the provision of conventional shelter difficult. However, Roberts (1984, priv comm) emphasises the value of 'peat hags' and tussocks and points to the 'natural habitat' areas for which hill sheep flocks show marked preference (the 'Cynefin'). Perhaps shelter needs should be designed first and foremost with the 'Cynefin' in mind?

Lambs with access to shelter may not be accompanied by the ewes (Miller 1968); shelter may thus reduce perinatal mortality but its subsequent effects on lamb growth may be less predictable.

Although the 'Critical Temperature' of the mature, well fleeced sheep is very low, high mortality has been recorded in Australia following shearing (Hutchinson and McRae 1969) albeit in laboratory studies - when plastic coats benefited shorn sheep greatly.

Severe losses have been noted when sheep, retreating in the teeth of a blizzard, encounter obstacles such as fences and rivers which terminate their progress to shelter andtrap them in areas where they encounter severe exposure and/or deep snow drifts.

Since blizzards may derive from a variety of directions, designing fencing that does not hazard stock may prove impossible; it is perhaps best to design for the worst direction (which may not be the most frequent blizzard direction).

The loss of production apparently resulting from exposure must be balanced against the expense of establishing shelter and the resulting land loss: Lucas (1979) expresses doubts as to the net gain in supplying shelter purely for the benefit of herbage growth in Britain; in order to make this judgement for livestock we need to investigate further:

(i) the detailed microclimate experienced by lambs in relation to conventional met observations;

(ii) the influence of shelter on animal performance and behaviour;

(iii) the shelter needed to provide the climate both for lamb survival and improved food utilization; influence of sub-maintenance intakes;

(iv) the likelihood that the lambs will benefit at critical times;

(v) stock management systems designed to exploit the potential advantages of shelter.

III A CHRONOLOGICAL REVIEW OF STUDIES INTO SHELTER OF LIVESTOCK - PARTICULARLY SHEEP/LAMBS

Michael (1960) - different breeds and types vary in their susceptability to exposure; fewer cases of twin lamb disease in Wales among sheep given access to woodland area and decrease of hypomagnesaemia and entero-toxaemia for ewes and cattle having natural shelter. Value of shelter greater in places where stock are concentrated; art of shepherding is to counteract excessive periods of sheltering to the detriment of foraging.

Nichols (1960) - livestock display a cycle of physiological states and events which gives rise to varying degrees of stress and threshholds of risk. During a four day observation period at Aberystwyth sheep moved to sheltered areas as the 'cooling power' of the air increased (assessed by a 'Kata' thermometer). Under adverse conditions 80% of flock sought geomorphic and vegetative shelter.

Munro (1962) - shelter studies in Scotland on 40 acres of hill ground with 16 Blackface ewes. Sheltering behaviour initiated with windspeeds over 24 m.p.h. and increased markedly at temperatures below freezing. Sheltering observed at above freezing temperatures only when associated with rapid temperature falls. No relationship found between sheltering behavious of sheep and rainfall, wind direction or season. The sensitivity of sheep to exposure was thus apparently dominated by the wind factor.

Doney (1963) of HFRO - effect of exposure in Blackface sheep with particular reference to the role of the fleece. In both trial years of maintenance feeding the exposed group lost weight relative to the sheltered group (in a shed) Suggests that depth of wool and weight or volume per unit area of skin have some effect in reducing weight loss under climate stress. Exposure to moderate winds increased heat flow by between 3 and 5 X suggesting differences in coat insulation could be found within a breed of sheep.

Blaxter, Clapperton and Wainman (1966) - results strongly suggest that there are breed differences in response to climate exposure, perhaps associated with fleece types.

Purser and Karam (1967) - using data from 2,000 Welsh Mountain lambs with wide variation in birthcoat type associated lamb mortality to weaning with birthcoat type (although effect was only significant before 14 days). Fine birthcoat lambs showed highest losses (13%). Subsequent growth did not show significant correlation with birthcoat grade.

Winfield, Brown & Lucas (1968) - studied responses of in-lamb Welsh Mountain ewes to compulsory exposure and shelter under various feeding levels with object of providing information relevent to shelter for Welsh hill farms.

Complete exposure to the hill climate was taken as 'control' and there were two levels of shelter - 'partial' (shelterbelts) and 'indoor' (a commercial in-wintering house). Ewes fed indoors at maintenance had greater live weights than those similarly fed in exposed or partially sheltered environment. Daily voluntary intake of ewes fed to appetite was 20% less in indoor studies. Post partum live weights were not significantly different from exposed case.

Environment seemed not to affect clean wool weight.

Winfield, Brown & Lucas (1969) - Welsh Mountain ewes appeared to seek sites sufficiently sheltered to offer wind speeds considered as 'average' over several seasons at the base site and to have a coating power below a given threshhold.

However, there was generally a time delay between the time of lambing and the recording of environment; there was considerable variability in percent seeking shelter on each occasion. Only imposed compulsory shelter seems

likely to be fully effective. These studies did not define the degree of exposure which can be tolerated without harm by the lamb.

Robinson, Brown and Lucas (1973) - studied the effects on productivity of the Welsh Mountain ewe and lamb of shelter and feeding levels. Pregnant hill sheep typically lost 8 to 20% of their weight during winter when quantity and quality of herbage are low. Does shelter benefit the undernourished ewe? Outdoor exposure reduced pre-partum ewe weight by about 1.5 Kg, i.e. 10% reduction in Digestable organic Matter. Magnitude not greatly affected by feeding levels. All studies indicated that exposure during last 16 weeks of pregnancy has only very small effect on lamb and ewe performance.

Alliston & Lucas (1979) - the response to flushing and housing of Welsh Mountain ewes. No evidence that housing was of benefit to reproductive performance either when ewes were kept indoors throughout the winter or only at mating or late pregnancy.

It was evident that Welsh Mountain sheep did not respond favourably to housing during lactation.

Lynch, Mottershead & Alexander (1980) - investigation of shelter and lamb mortality in Australia among shorn Merino lambing in 12 ha. paddocks, one with five grass hedges.

Lamb mortality in the sheltered paddock was half that in unsheltered paddock. Hypothermic deaths in windy weather were higher (at 12%) in unsheltered than sheltered paddocks (5%) - although significant rain was not experienced. The effectiveness of shelter in wet weather remains to be examined.

The authors' remark that driving rain may drive ewes from centrally placed shelter so that shelter near fences could be advantageous. The continued use of shelter after lambing suggests sheep were using sites as 'camp areas' rather than shelter.

The studies have several practical implications for the Australian experience.

Lynch & Donnelly (1980) - the effect of windbreaks was studied in an experiment in which sheep were grazed continuously at 15, 30 and 37.5 ha^{-1} for five years. The paddocks were either square or rectangular in shape with fences of sheet iron or wire. In the square paddocks the sheet iron fences acted as a windbreak providing protection for plants and animals.

In the first two years when rainfall was well below average, sheep in sheltered paddocks at 37.5 sheep ha^{-1} had marginally higher production than sheep in the other treatments, while at 15 sheep ha^{-1} the productivity of the sheltered sheep was markedly higher. During the remaining three years, there were no large differences between treatments in herbage or animal production at the lowest stocking rate, while at the highest stocking rate sheep in sheltered paddocks had substantially higher production than those in unsheltered treatments. At 30 sheep ha^{-1} there was also increased plant and animal productivity from sheltered paddocks during the last two years of the experiment.

This experiment is one of the first to show the effect of a windbreak on grazed pastures. The results indicate that shelter may have an important place in increasing pasture and animal production in the temperate areas of Australia.

Ralph (1981) - summarises Australian work as follows:

Shearing shortly before lambing encouraged ewes to seek shelter on cold, windy days; ewes shorn 4 weeks before lambing and given brief access to shelter, then removed, returned to the sheltered areas when returned to the paddock prior to lambing.

Ewes tended to favour higher end of any paddock and even shorn sheep will ignore shelter too far from high end. Forcing shelter upon stock may be essential - achieved by constructing/giving shelter at 20m intervals across the paddock.

Slee (1981) - the ability of lambs to resist cold exposure is a function of genetic and physiological factors.

Starr (1984) - lamb-wind-chill forecasts for lowland lambs based on several years of field studies of lamb mortality/weather relationships.

Sturrock (1984) - reports on the value of shelter in various areas of agricultural production with reference to New Zealand.

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Figures

The photographs were taken at Pwllpeiran EHF.

1. Mr Richards stands beside a 'peat hag.'

2. A block planting of Sitka spruce.

3. A grassland area surrounded by sheltering evergreens to which sheep could be shepherded in severe conditions. Note the access road to the left.

Any comments or suggestions relating to this paper should be addressed to the author.

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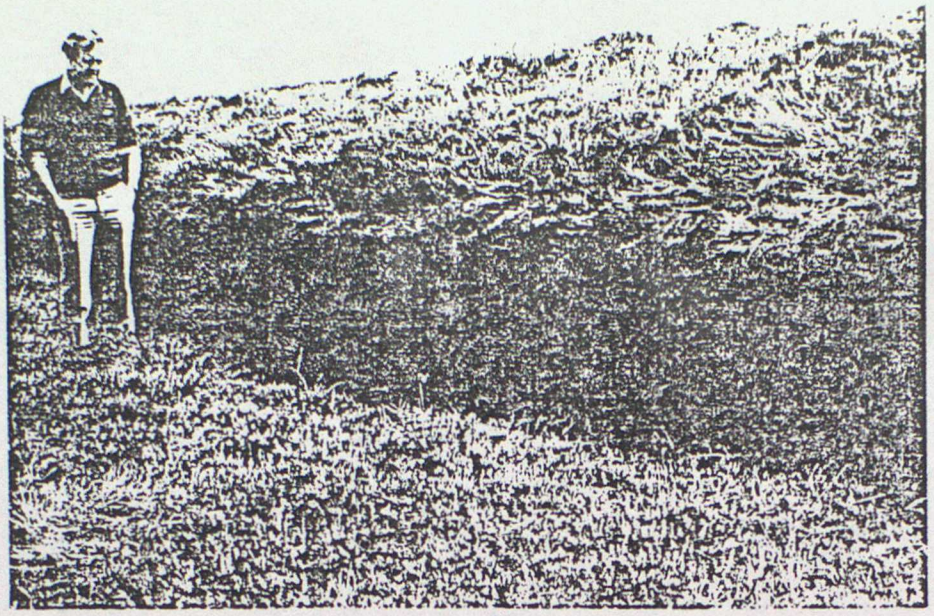

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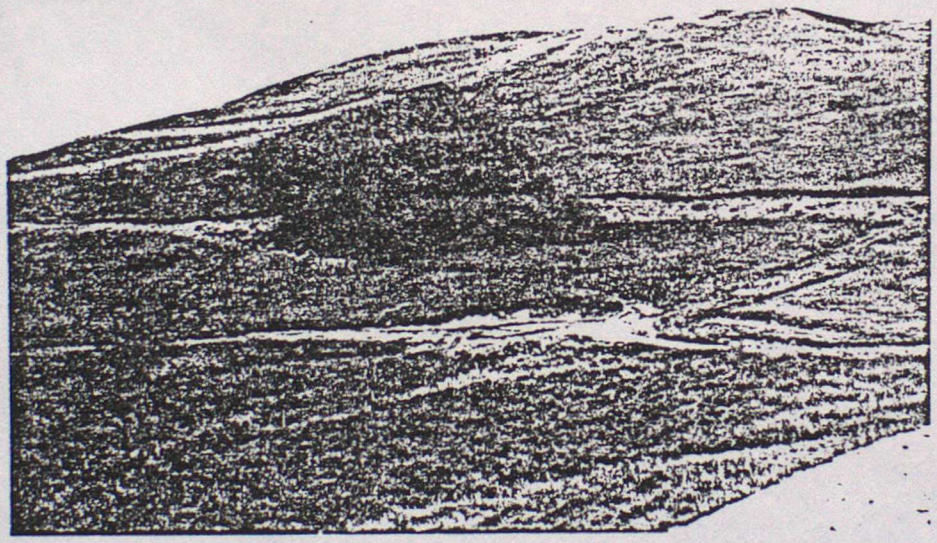

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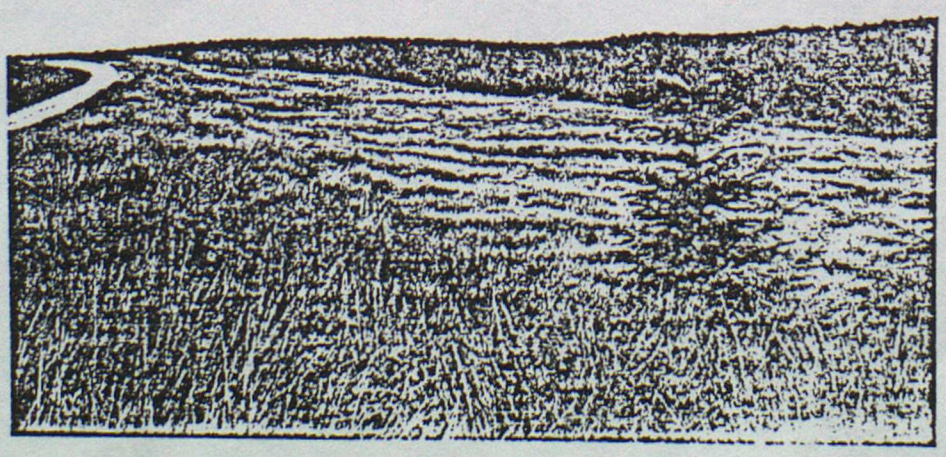

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